EASTERN REGION LABORATORY PROCEDURES MANUAL

EXAMINATION NO. 18

NAME: _____

COMPANY: _____

ADDRESS: _____

_____

DATE: _____

Mail to:

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Federal Aviation Administration
Airports Division, AEA-620
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Jamaica, NY 11434

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EXAM QUESTIONS

NOTE: For True/False questions, if the answer is false,
You must provide an explanation in the space provided
under the question or on a separate sheet.

1. The optimum asphalt content of the paving mix is determined
   at approximately the mid value of the percent of air voids
   specifications.

   True _____ False _____

2. The temperature of the mixture prior the compaction of
   Marshall specimens, when Performance Grade asphalt is used,
   shall be $280^{\circ} \pm 5^{\circ}$ F.

   True _____ False _____

3. The thickness of a particular Marshall specimen is
   determined to be 2-1/2 inches and it measured stability 2100
   lbs. The true Marshall stability to be reported for this
   specimen is 1900 lbs.

   True _____ False _____

4. The method used to determine the Maximum Specific Gravity
   (G_{mm}) of the mix is:

   a. Individual Constituents

   b. ASTM D 2041

   c. Solvent Immersion

   d. Statistical Analysis

   Answer: _____

5. According to ASTM D 4867, the minimum number of test
   specimens used to determine the effect of moisture (Tensile
   Strength Ratio) on asphalt concrete paving mixture is:

   a. 8
   b. 6
   c. 10
   d. 4

6. When the resulting asphalt content for a proposed job mix
   formula does not coincide with an asphalt content used in
   the trial specimens, there is no need to verify the actual
   result of the calculated asphalt content.

   True_____   False_____

7. Given:

G_{mb}, bulk specific gravity of compacted mixture = 2.344

G_{sb}, bulk specific gravity of aggregate = 2.651

P_s, aggregate, percent by total weight of the mixture

= 93.04

P_b, asphalt, by weight of aggregate = 7.480

Determine the VMA by:

a) total weight of mix,

b) total weight of aggregate.

8. During the development of the JMF, for determining the bulk specific gravity of freshly compacted specimens, the test shall be performed in accordance with procedure 9.1 of ASTM D 2726 for Thoroughly Dry Specimens

   True _____   False _____

9. For air voids determination, the Maximum Specific Gravity
    is determined by ASTM D 2041 a minimum of two times (one
    every other sublot) for each lot of material.

    True _____   False _____

10. A two-inch lift is placed on an existing runway. Based on
    the random sampling procedure in Section 6 of the manual,
    samples are required to be taken at locations no closer than
    one foot from a pavement edge or joint.

    True_____   False_____

11. Due to a plant shutdown, the Marshall properties of a lot
    of material are determined using 6 sublots (n=6), therefore,
    in order to determine the Percent Compaction of the lot, six
    cores shall be taken from the field compacted material.

    True _____   False _____

12. When conducting Extraction Tests for the Contractor Quality
    Control Plan, the weight of ash portion is determined at
    the beginning of plant production only.

    True_____   False_____

13. A paved area consist of three lanes 25 feet in width and
    500 feet in length (for a total of 1500 feet), staggered 50
    feet from each other in the paving direction.

a) What is the length of the longitudinal joint?

    _____ feet.

b) If number 15 is drawn from the container, what is the
   distance from the beginning of the paving point, to each of
   the four locations where samples for joint testing must be
   taken?

    Sublot 1   _____   feet

    Sublot 2   _____   feet

    Sublot 3   _____   feet

    Sublot 4   _____   feet

14. A 25-foot paver places lot of material 1600 lane feet in length. The contract specification requires four (4) cores per lot (one per sublot). The number 21 is drawn from the container (this is the second time number 21 has been drawn in the project)

   a) Indicate the sublot size in lane feet

   b) List the sub-column A, B and C numbers used to determine the sampling location:

	A	B	C
sublot 1			
sublot 2			
sublot 3			
sublot 4			

   c) Indicate the longitudinal station from the beginning of each sublot, and the offset referenced from the edge of the paving lane for each test location

	Station	Offset
sublot 1		
sublot 2		
sublot 3		
sublot 4		

15. The specifications indicate a lot for P-401 production as being one day's production with four (4) Marshall Tests performed per lot (one per sublot). The plant will be producing 1800 tons per day. From the first sublot of material, a sample is to be drawn for Marshal tests. A random sampling procedure based on tonnage will be employed to obtain samples. Assuming that the sublots are to be divided into 25 tons increment and the number 5 is drawn from the container of random numbers, answer the following questions:

a) Sublot size:

b) Number of increment per sublot:

c) Number of tons after start production (first sublot) that the sample is to be taken:

16. For lot number 5 of an apron paving project, the average bulk specific gravity for all laboratory prepared specimens was 2.445. Four cores were taken on the mat-in-place material for lot number 5 and the bulk specific gravity for each core is shown in column A in the table below. The contractor disagreed with the test results and applied for a resampling. Four additional cores were taken and the bulk specific gravity for each core is shown in column B in the table below. Calculate the PWL for Percent Compaction for the resampled lot number 5. Show all calculations on the attached Forms from Appendix F of the manual

Sublot	A	B
1	2.355	2.395
2	2.380	2.400
3	2.375	2.390
4	2.385	2.410

17. For one day of a paving project for a runway serving aircraft weighing more than 60,000 pounds, four pavement cores and plant produced material were obtained using the sampling procedure of Section 6 of the manual. The table below shows the bulk specific gravity for each core and the average of the bulk specific gravity for each sublot of laboratory specimens prepared for the lot. Calculate the percent of payment based on percent compaction. Show all calculations on the attached forms from Appendix F of the manual.

	G_{mb} cores	G_{mb} specimens
Sublot no. 1	2.368	2.359
Sublot no. 2	2.376	2.360
Sublot no. 3	2.365	2.356
Sublot no. 4	2.375	2.292

18. Given the following Marshall air void test data and the
    P-401 specification, determine the percent Marshall air
    voids within limit and the percent of payment. Show all
    calculation in the attached form from Appendix D of the
    manual.

Lot no. 20	% Air Voids
Sublot no. 1	3.6
Sublot no. 2	3.0
Sublot no. 3	3.9
Sublot no. 4	2.8

19. Given the following Marshall stability test data and the
    P-401 specification for a runway serving aircraft with Gross
    Weight of 60,000 Lbs. or more, determine the percent within
    limit for stability. Show all calculation on the attached
    form from Appendix D of the manual

Lot no. 5	Stability
Sublot 1	2350
Sublot 2	2250
Sublot 3	2100
Sublot 4	1900

20. Given the following Marshall flow values and the P-401 specification for a runway serving aircraft with Gross Weight of 60,000 Lbs. or more, determine the percent within limit for the flow values. Show all calculation on the attached form from Appendix D of the Manual. The form can be modified as required for this problem.

Lot no. 22	Flow
Sublot no. 1	16

Lot no. 23	Flow
Sublot no. 1	14
Sublot no. 2	11
Sublot no. 3	8
Sublot no. 4	6

CORE PERCENT COMPACTION

SUBLOT NO	IN-PLACE BULK SPECIFIC GRAVITY (Gmbf) ASTM D 2726 PROCEDURE 9.1	AVERAGE BULK SPECIFIC GRAVITY OF ALL LABORATORY SPECIMENS (Gmbl)	(Gmbf/Gmbl) X 100
1			
2			
3			
4			
RESAMPLE 1			
RESAMPLE 2			
RESAMPLE 3			
RESAMPLE 4			
CALCULATED BY		DATE	
AFILIATION			

MAT DENSITY – PERCENT COMPACTION

PERCENT WITHIN LIMITS (PWL)

SUBLOT 1 (%)	RESAMPLE 1 (%)
SUBLOT 2 (%)	RESAMPLE 2 (%)
SUBLOT 3 (%)	RESAMPLE 3 (%)
SUBLOT 4 (%)	RESAMPLE 4 (%)

X (AVERAGE)	*
S_n (STANDARD DEVIATION)	*
L (LOWER LIMIT) = 96.3	
Q_L = (X–L)/S_n =	
PWL (% TABLE 1, SECTION 8) =	
* TO THE NEAREST HUNDREDTH (TWO DECIMAL PLACES)	

CALCULATED BY	DATE
AFILIATION	

CORE PERCENT COMPACTION

SUBLOT NO	IN-PLACE BULK SPECIFIC GRAVITY(Gmbf) ASTM D 2726 PROCEDURE 9.1	AVERAGE BULK SPECIFIC GRAVITY OF ALL LABORATORY SPECIMENS (Gmbl)	(Gmbf/Gmbl) X 100
1			
2			
3			
4			
RESAMPLE 1			
RESAMPLE 2			
RESAMPLE 3			
RESAMPLE 4			
CALCULATED BY		DATE	
AFILIATION			

MAT DENSITY – PERCENT COMPACTION

PERCENT WITHIN LIMITS (PWL)

SUBLOT 1 (%)	RESAMPLE 1 (%)
SUBLOT 2 (%)	RESAMPLE 2 (%)
SUBLOT 3 (%)	RESAMPLE 3 (%)
SUBLOT 4 (%)	RESAMPLE 4 (%)

X (AVERAGE)   *

S_n (STANDARD DEVIATION)   *

L (LOWER LIMIT) = 96.3

$Q_L = (X-L)/S_n =$

PWL (% TABLE 1, SECTION 8) =

   * TO THE NEAREST HUNDREDTH (TWO DECIMAL PLACES)

CALCULATED BY	DATE
AFILIATION	

AIR VOIDS (VTM) ACCEPTANCE CALCULATION

(LABORATORY MARSHALL SPECIMENS)

PERCENT WITHIN LIMIT (PWL)

SUBLOT 1(AVERAGE) =   *

SUBLOT 2 (AVERAGE) =   *

SUBLOT 3 (AVERAGE) =   *

SUBLOT 4 (AVERAGE) =   *

X (AVERAGE) =   *

S_N (STANDARD DEVIATION) =   **

L (LOWER LIMIT) = 2.0	U (UPPER LIMIT) = 5.0
$Q_L = (X - L)/S_N =$	$Q_U = (U - X)/S_N =$
$P_L =$ (% TABLE 1, SECTION 8) =	$P_U =$ (% TABLE 1, SECTION 8) =

PWL = (P_L + P_U) – 100

PWL =

*   TO THE NEAREST TENTH (ONE DECIMAL PLACE)
**   TO THE NEAREST HUNDREDTH (TWO DECIMAL PLACES)

CALCULATION BY:	DATE

AFFILIATION

STABILITY ACCEPTANCE CALCULATION

(LABORATORY MARSHALL SPECIMENS)

PERCENT WITHIN LIMITS (PWL)

SUBLOT 1 (AVERAGE) =	*
SUBLOT 2 (AVERAGE) =	*
SUBLOT 3 (AVERAGE) =	*
SUBLOT 4 (AVERAGE) =	*
X (AVERAGE) =	*
Sn (STANDARD DEVIATION) =	**
L (LOWER LIMIT) =	***
$Q_L = (X - L)/Sn$ =	
P_L = (% TABLE 1, SECTION 8)	

*	TO THE NEAREST WHOLE NUMBER
**	TO THE NEAREST TENTH (ONE DECIMAL PLACE)
***	USE VALUE IN TABLE 5 OF SPECIFICATION

CALCULATED BY	DATE
AFFILIATION	

FLOW ACCEPTANCE CALCULATION

(LABORATORY MARSHALL SPECIMENS)
PERCENT WITHIN LIMIT (PWL)

SUBLOT 1(AVERAGE) =   *

SUBLOT 2 (AVERAGE) =   *

SUBLOT 3 (AVERAGE) =   *

SUBLOT 4 (AVERAGE) =   *

X (AVERAGE) =   *

S_N (STANDARD DEVIATION) =   **

L (LOWER LIMIT) = 8	U (UPPER LIMIT) = ***
$Q_L = (X - L)/S_N$ =	$Q_U = (U - X)/S_N$ =
P_L = (% TABLE 1, SECTION 8) =	P_U = (% TABLE 1, SECTION 8) =

PWL = (P_L + P_U) – 100

PWL =

*	TO THE NEAREST TENTH (ONE DECIMAL PLACE)
**	TO THE NEAREST HUNDREDTH (TWO DECIMAL PLACES)
***	USE VALUE IN TABLE 5 OF SPECIFICATION

CALCULATED BY:	DATE

AFFILIATION